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December 7, 2004

Via Federal Express
Noboru Otsuka
Hitachi, Ltd.
IP Development & Management Division
Patent Dept. 4
292, Yoshida-cho, Totsuka, Yokohama-shi
Kanagawa, Japan 244-0817

RE: PATENTABILITY SEARCH FOR STORAGE SYSTEM STORAGE CONTROL DEVICE AND DATA RELAY METHOD USING STORAGE CONTROL DEVICE
Your File: 340301294US01
Our Docket: PSP-1042041

Dear Mr. Otsuka:

In accordance with your request, we have conducted a patentability search on the above-identified subject matter.

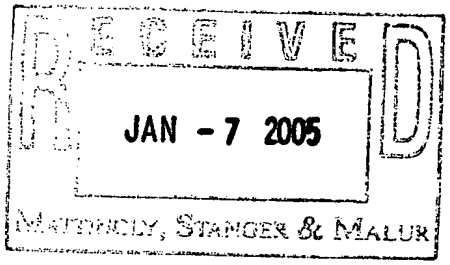
Enclosed with this report are copies of the search results and your disclosure materials. If after reviewing the results, you feel that the search feature (or specific search elements), the field of search, or results are not commensurate with your original request, or you would like to extend the search into additional areas, please contact us.

Sincerely,

Jerry R. Lacasse

Jerry R. Lacasse

Enclosures
JRL:TT:dcw
s04/psp1042041



CONFIDENTIAL
(Patentability Search)

I. SEARCH FEATURE

A. General

Relay system, volume mapping

B. Specific

A plurality of virtual volumes with different control functions are associated with one real volume and remote copying is conducted. A relay system comprises a plurality of virtual volumes V12. V21 mapped to the same real volume R1. A virtual volume V21 for transmission control is mapped to a real volume R1, a real volume R2 is mapped to the virtual volume V21, and the virtual volume V12 for reception control is mapped to the real volume R2. If a command is received from a local system 10, the virtual volume V12 for reception control writes data into the virtual volume V21 via the real volume R2 (virtual entity). The virtual volume V21 transmits the data to a copy destination volume V22 and writes the data into the real volume R1.

C. Application

Remote copying

II. FIELD OF SEARCH

The search of the above features was conducted in the following areas:

A. Classification search

Class	Subclasses	Description
707/		**DATA PROCESSING: DATABASE AND FILE MANAGEMENT OR DATA STRUCTURES**
	1	DATABASE OR FILE ACCESSING
	200	FILE OR DATABASE MAINTENANCE
	202	..Recoverability
709/		**ELECTRICAL COMPUTERS AND DIGITAL PROCESSING SYSTEMS: MULTICOMPUTER DATA TRANSFERRING OR PLURAL PROCESSOR SYNCHRONIZATION**
	202	..Processing agent

Class	Subclasses	Description (continued)
711/		**ELECTRICAL COMPUTERS AND DIGITAL PROCESSING SYSTEMS: MEMORY**
	113	....Caching
	114	....Arrayed (e.g., RAIDs)
	165	..Internal relocation
	203	..Virtual addressing

The above subclasses represent areas deemed to contain subject matter of interest to one or more of the search features. Please note that relevant references may be classified outside of these areas. The integrity of the search is based on the records as presented to us by the United States Patent and Trademark Office (USPTO). No further integrity studies were performed. Also a key word search was performed on the USPTO full-text database including published U.S. patent applications.

III. RESULTS OF SEARCH

A. References developed as a result of search:

U.S. Patent No.	Inventor
6,389,420 B1	Vahalia et al.

U.S. Patent Application Publication No.	Inventor
2003/0110157 A1	Maki et al.
2004/0006587 A1	McConnell et al.
2004/0186898 A1	Kimura et al.
2004/0205145 A1	Murakami

B. Discussion of related references in numerical order:

The patent to Vahalia et al. (6,389,420 B1), assigned to EMC Corp., provides for a *File Manager Providing Distributed Locking and Metadata Management for Shard Data Access by Clients Relinquishing Locks after Time Period Expiration*. Disclosed is a first file manager **31** for relaying the metadata to a first client **38**. A second file manager **32** relays the metadata to a second client **38** (see figures 1-2; and column 6, lines 44-66).

The patent application to Maki et al. (2003/0110157 A1) provides for an *Exclusive Access Control Apparatus and Method.* Disclosed is a relay device **1100** connected to each of a plurality of computers **1000** and one or a plurality of storage devices **1800** (via communication paths **1110** and **1130**). A general virtual configuration information table **1616** (of the relay device) is used to set a virtual volume in a relationship with an actual storage area (real volume) within a storage device (see figures 1, 11; and paragraphs 22, 29, 31, 32, and 35).

The patent application to McConnell et al. (2004/0006587 A1), assigned to Dell Products, L.P., provides for *Information Handling System and Method for Clustering with Internal Cross Coupled Storage.* Disclosed is a plurality of nodes using virtual quorum **220/225** in each node. Each node has an internal storage facility. The virtual quorums **220/225** receive storage commands that are processed by a mirror agent **245** in each node. Each mirror agent **245** relays storage commands to internal storages **294/298** of each node (the servers **308**) (see figures 1-2; and paragraphs 6, 17, and 20-21).

The patent to Kimura et al. (2004/0186898 A1) provides for *Control of Storage and Read of Data on Mass Storage Device.* Disclosed is a node device **200** functioning to relay the data between a storage device **300** and a computer **100**. In the node device **200**, a CPU **201** performs relay control and cache control of the data according to a control program. Virtual volumes $\mathbf{VC_a}$ and $\mathbf{VC_b}$ (corresponding to clients **100a -100b**) are defined in the node device **200**. The virtual volume $\mathbf{VC_a}$ is allocated to a specific volume $\mathbf{PC_a}$ and a share volume $\mathbf{PC_c}$. The virtual volume $\mathbf{VC_b}$ is allocated to a specific volume $\mathbf{PC_b}$ and the share volume $\mathbf{PC_c}$ (see figures 2, 6; and paragraphs 11, 13, 14, 24-25, 50, 51, 56, 57, and 58).

The patent application to Murakami (2004/0205145 A1) provides for a *Data Transfer Method.* Disclosed is a switch **100** as a relay device connected to storage devices (**180A**, **180B**, and **180C**). A table area **503** includes a volume management table **507** related to a real/virtual volume management **506**. Table **1200** manages a state of a logical unit in a virtual volume (see figures 1, 4-5, 9, 11; and paragraphs 7-9, 12, 14, 16, 37, 38, 40, 41, 47, 68, 72, 74, and 99).

Thien Tran